MODEL 8300-RC

INSTRUMENTATION

AMPLIFIER

PRESTON

PRESTON SCIENTIFIC INCORPORATED
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Analog-to-Digital Converters
Instrumentation Amplifiers
Multiplexers
Analog Systems
Computer Peripheral Equipment

MODIFICATION PAGE

MODEL: 8300-RC

TYPE: 13700-55

CUSTOMER: AUTONETICS

MODIFICATION:

The Type 13700-55 conforms to the parameters described in Section 1 of this manual. However, modifications were made to comply with the customers specifications as follows:

(1) The unit provides six relay-selected calibrated gains of 1, 5, 10, 50, 100 and 500

(2) The unit provides for switch-selectable bandwidths of 10 KHz, 1 KHz, 100 Hz and 10 Hz

The drawings that define the 13700-55 Amplifier are listed below:

Dwg No.	Description	Sheet No.
13700-55	Amplifier Assembly	1 of 1
13700-30	Amplifier Schematic	2 of 2
13710-30	Printed Circuit Assembly	1 of 1

INSTRUCTION MANUAL

MODEL 8300-RC

FLOATING DIFFERENTIAL AMPLIFIER

PRESTON SCIENTIFIC INCORPORATED
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ANAHEIM, CALIFORNIA

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SECTION 1

INTRODUCTION AND SPECIFICATIONS

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SECTION 1

INTRODUCTION AND SPECIFICATIONS

1.1 INTRODUCTION

The Preston Model 8300-RC Amplifier is a wide-band, floating differential amplifier with external controlled gain changes (maximum of six). It is ideally suited for any instrumentation application requiring high accuracy, high input impedance, high common mode rejection with large common mode voltages, high load capability, or rapid recovery from input overloads. This model is used most frequently in low level data systems.

1.2 SUMMARY OF SPECIFICATIONS

Gain: The gain may be set remotely to any of two to six fixed gain positions. When six gains are used, the lowest gain must be unity. For changing of gains, Preston utilizes 6, 12 and 24 volt standard relays. It is recommended that the polarity of the common be specified in the customer's specification. Drive circuits must be capable of driving from one to four relays simultaneously. The standard amplifier requires minus signal to select gain. Gain accuracy is ±0.01% ±3 microvolts RTI at DC. The bandwidth will remain constant over all gain positions.

Gain Linearity: ±0.01% ±3 microvolts RTI at DC.

Gain Stability: ±0.01% ±3 microvolts RTI at DC. Vernier front panel trim-pot is provided for calibration.

Bandwidth: -3 db at 1 kc. A switch-selected filter varies bandwidth from 1 kc to 100 cps or 10 cps. This filter is an active two-pole critically damped filter. Other bandwidths are available on special order.

Settling Time: At a bandwidth of 1 kc, settling time is a maximum of 1.7 milliseconds to ±0.01% of final value ±3 microvolts RTI. After gain relay pull-in, amplifier requires 1.7 milliseconds to settle to new gain to within 0.01% ±3 microvolts RTI.

Common Mode Rejection: Minimum common mode rejection is 130 db, DC to 60 Hz, line unbalance 1000 ohms. Typical DC common mode rejection is 150 db. Maximum common mode voltage is 250 volts peak AC or DC. Input requires 3-wire connection.

Chopper Intermodulation: Less than ± 0.01%.

Noise: Input noise 3 microvolts RTI maximum; output noise 1 millivolt peak RTO maximum. Measurement bandwidth 1 kc.

Drift: Maximum drift will be 0.3 microvolts per 1°C. Front panel zero trim allows amplifier to be set to zero. Long term drift 10 microvolts/month maximum at ±10% line.

Input Impedance: 100 megohms minimum all ranges at DC.

Output: Output capability is ±10 volts ±100 ma. Output impedance is 1 ohm maximum, stable with up to 0.22 microfarad load.

Overload: At an overload of 10 volts, the unit will recover in 1.7 milliseconds to 0.05%±10 microvolts RTI, in IKC bandwidth operation.

Unconditionally short circuit proof - maximum output current 275 ma.

Power requirement 10 watts; operating temperature range 0°C to 40°C

SECTION 2

INSTALLATION

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SECTION 2

INSTALLATION

2.1 GENERAL

Mating connectors are supplied with each amplifier, or, if a mounting rack is supplied, the connectors are installed in the rack. Dwg 13700, Sheet 2, shows the outside dimensions of the amplifier and pin connections of the mating connectors.

2.2 INPUT CONNECTORS J1

The connecting cable should be two-conductor, twisted and shielded. To insure maximum common mode rejection, the shield of this cable should extend inside the connector shell before being pigtailed, and an electrical connection should be made between the shell and the shield. For convenience, a color code should be used to distinguish between "Input Hi" and "Input Lo."

2.3 OUTPUT AND POWER CONNECTOR J2

The output of the amplifier appears between Pins 1 and 9, with the "Output Shield" on Pins 2 and 10. "Output Lo" (Pin 9) is internally connected to "Output Shield" (Pins 2 and 10), and they may also be joined or not at their destination, depending on installation requirements.

115 volt, 60 cps power is connected to Pins 8 and 16 and the power transformer primary shield is connected to parallel Pins 7 and 15. This shield connection may be tied to ground through a power conduit ground circuit or may be connected to the "Output Lo"-"Output Shield" destination.

CAUTION: When assembling connector J2, insure that Pins 8 and 16 are towards the bottom of the amplifier. If this plug is inverted in its shell, severe damage to the amplifier will result.

2.4 COOLING

The air surrounding the amplifier should be kept between 0°C and 40°C for proper operation. Storage temperatures should be restricted to between -55°C and 85°C.

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SECTION 3

OPERATING INSTRUCTIONS

3.1 GENERAL

Operation of the amplifier starts with the application of power and an input signal. After a five-minute stabilizing period, the amplifier is ready for use.

Since the front panel controls are dependent upon the user's requirements, different combinations appear on various models. All available controls are described below.

3.2 CAL POT

The CAL POT calibrates the amplifier in the lowest gain position. After calibration of this gain, the amplifier gain will be within specification at all other gains.

3.3 BANDWIDTH SWITCH

The bandwidth switch selects a two-pole active filter in the output of the amplifier. The 3 db down frequency is marked on the front panel.

3.4 ZERO ADJUST

The zero of the amplifier may be offset by use of the ZERO ADJUST control. This control permits compensation for zero offsets in the amplifier and associated equipment.

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PRINCIPLES OF OPERATION

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SECTION 4

PRINCIPLES OF OPERATION

4.1 GENERAL

The Model 8300-RC Amplifier consists of an input amplifier, isolator, and output amplifier with filter, as shown in Figure 4-1. The input amplifier is chopper-stabilized and is powered by the isolator modulator drive. The isolator circuitry uses the output amplifier power supply. The input, input amplifier, and modulator are fully guarded and isolated from the chassis and the output.

4.2 INPUT AMPLIFIER

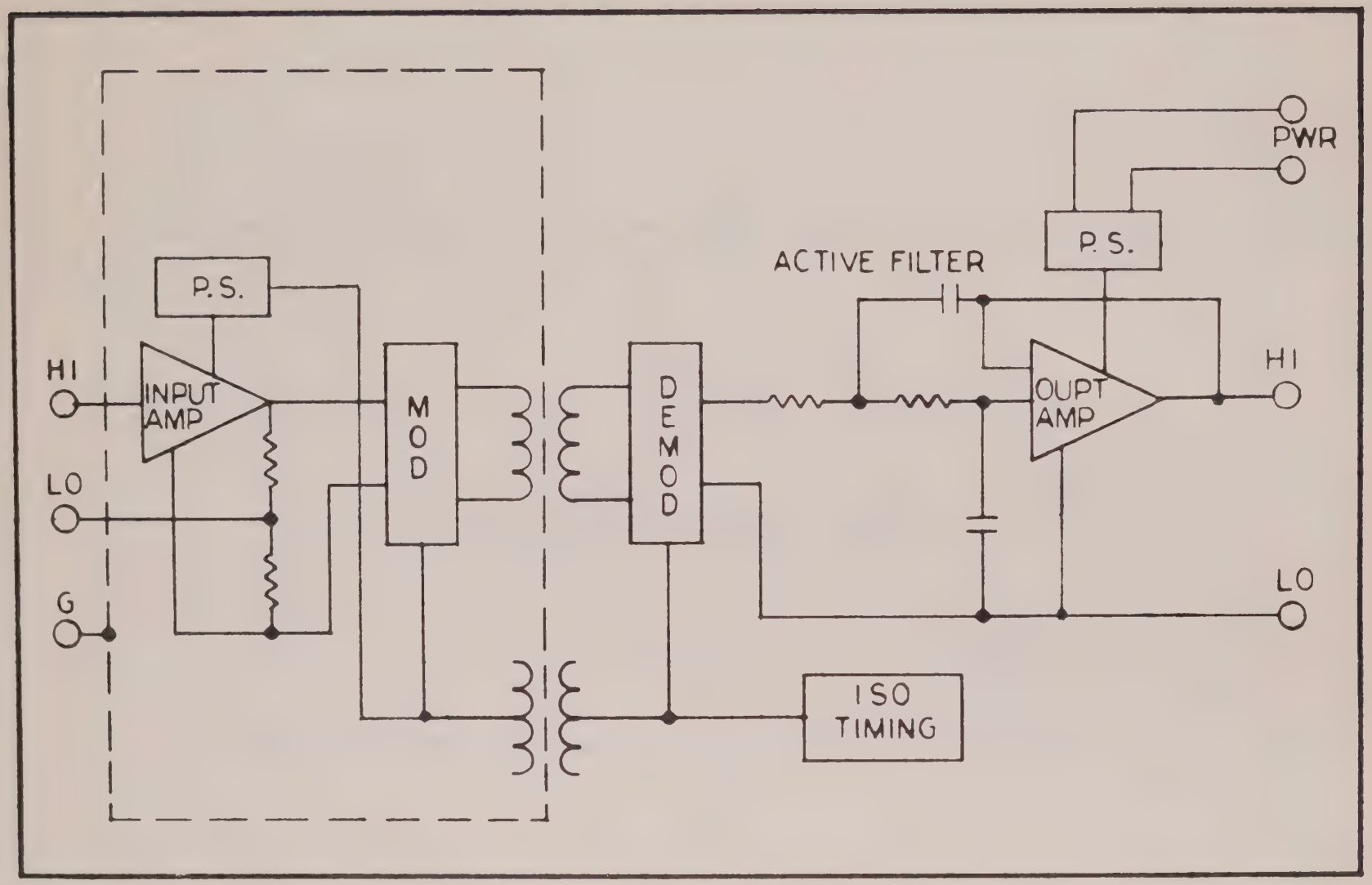
The input amplifier is a potentiometric-connected differential amplifier. It is enclosed in a guard shield which should be continued as the shield on the input cable, and referenced at the transducer end. The inputs are: Input HI, Input LO and Input Guard.

A fraction of the output voltage is compared with the input voltage and the difference is used as an error signal. The amplifier is chopper-stabilized in a parallel loop configuration as shown in Figure 4-2.

The signal is separated into AC and DC components. The DC component is modulated, amplified, demodulated, and filtered and then combined with the amplified AC component. The resultant signal is further amplified in the DC AMP. The AMP ZERO ADJUST permits cancellation of the inherent offset at the input to the DC AMP.

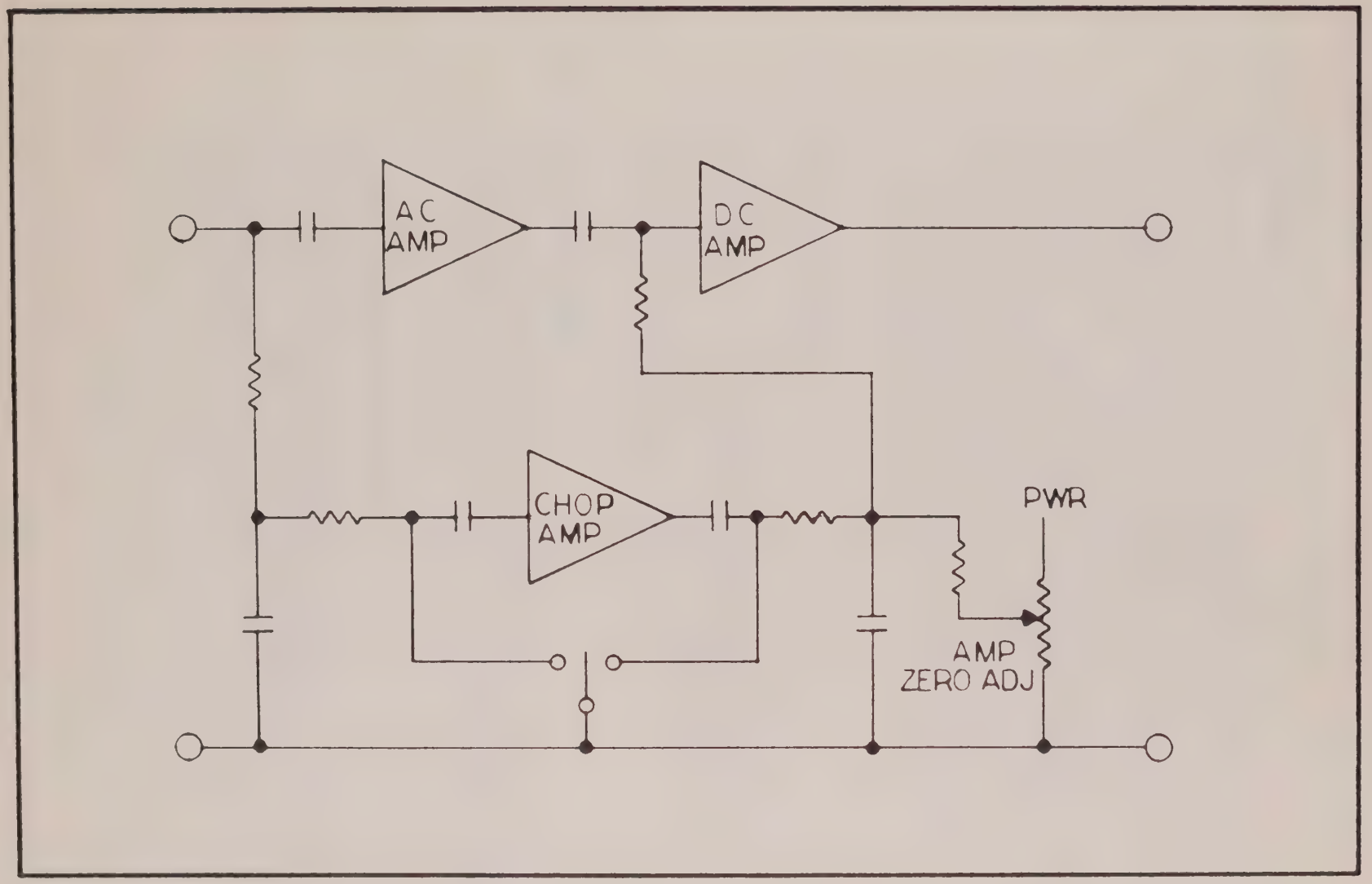
4.3 INPUT AMPLIFIER POWER SUPPLY

The input amplifier power supply provides DC voltages of plus and minus 20 volts DC. This power is derived by rectification and filtering of the modulator drive signal and is internally sub-regulated with a zener-transistor combination for use in the sensitive areas of the amplifier.



AMPLIFIER BLOCK DIAGRAM

FIGURE 4-1



INPUT AMPLIFIER BLOCK DIAGRAM

FIGURE 4-2

4.4 ISOLATOR

The isolator block diagram is shown in Figure 4-4. The modulator acts as a double pole-double throw switch to fullwave modulate the output of the input amplifier. The resultant 50 kc squarewave is coupled by the isolator transformer to the demodulator switches. The demod switches act as a double pole-double throw switch with a center OFF position. The demod switches are in the OFF position during the risetime of the transformer and then connect the output to the transformer. Amplifier polarity is controlled by the phasing of the demod switches. The output polarity of the amplifier may be reversed by interchanging the wires plugged in Terminals 88 and 89. (The proper tool to use in working with any taper pins in the amplifier is Inserter No. 380306-1, with Tip No. F-395005, manufactured by Amp, Inc., Harrisburg, Pennsylvania.) During the off period, DEMOD DISCONNECT, the output signal is stored on a capacitor to minimize carrier noise.

4.5 ISOLATOR TIMING

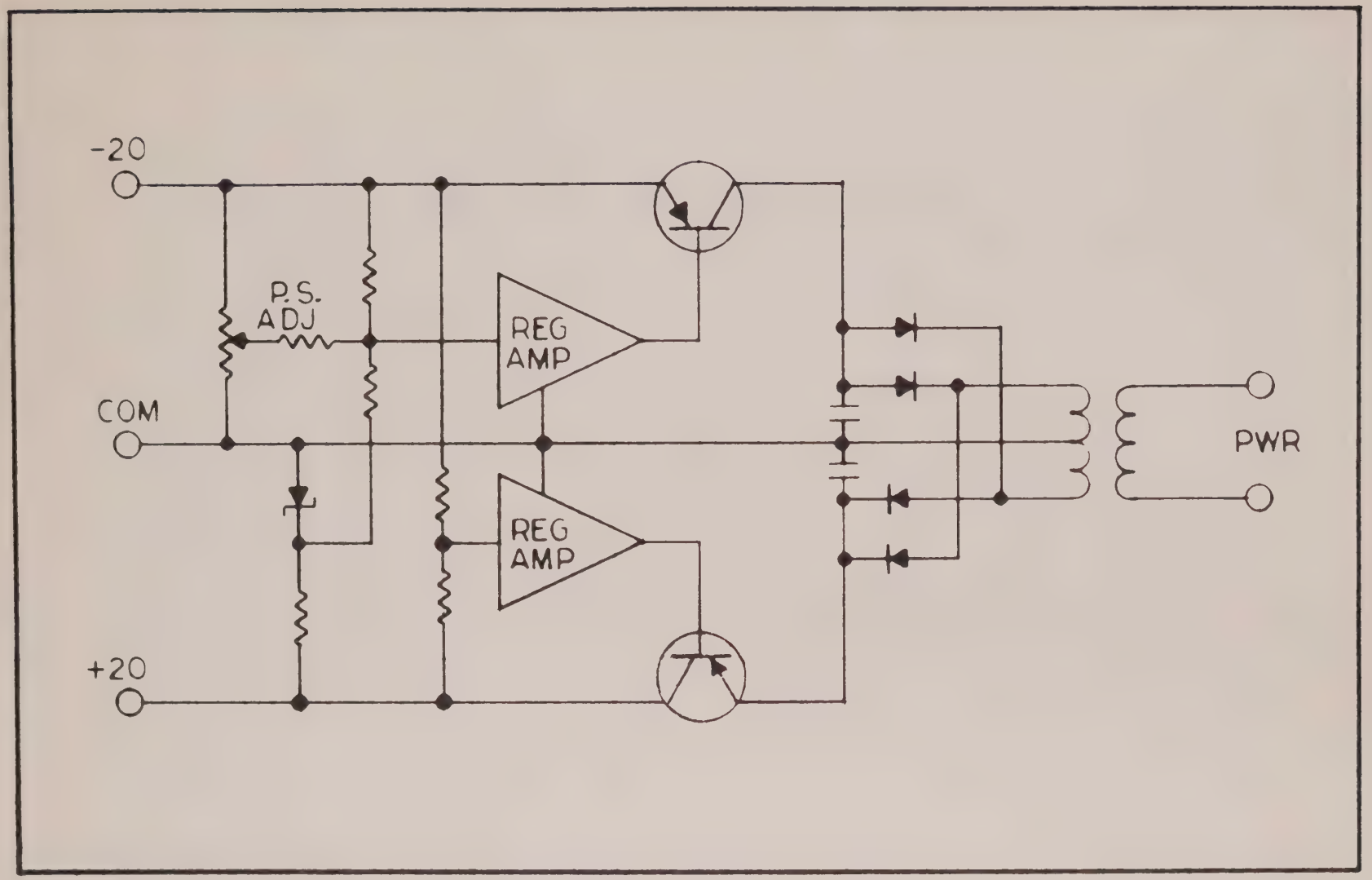
The isolator timing logic diagram is Figure 4-5, with the resultant timing shown in Figure 4-6. The free-running multivibrator produces a 100 kc signal which sets the demod disconnect time and drives the synchronized inverter at 50 kc to produce the mod-demod drive. Transformers couple the driving signals into the bases of the switching transistors.

4.6 OUTPUT AMPLIFIER

The output amplifier is a drift compensated differential amplifier with a thermally stabilized silicon input stage. This stage is followed by a silicon emitter-follower stage, a second amplifier stage, and the output drivers.

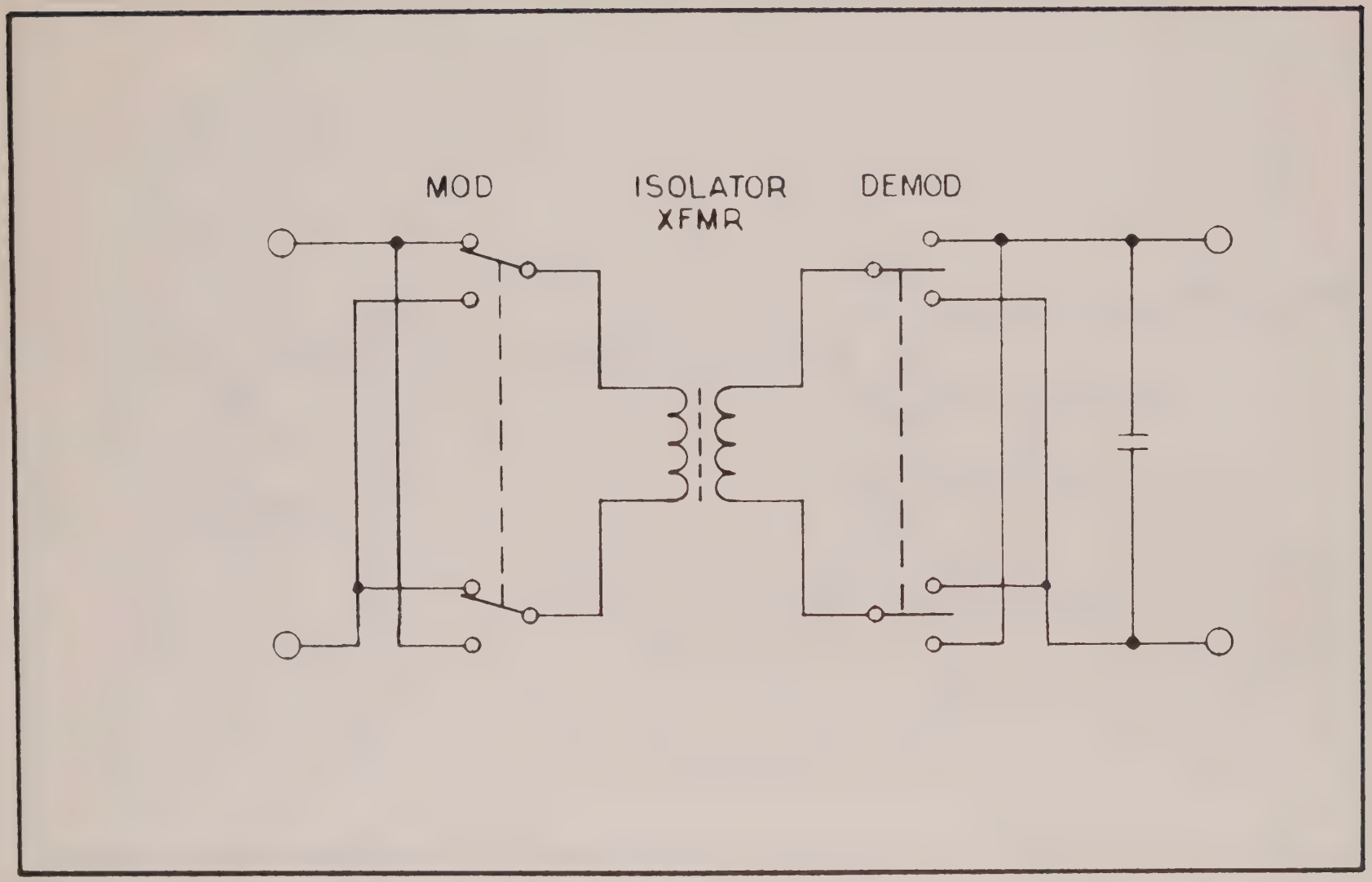
4.7 OUTPUT AMPLIFIER POWER SUPPLY

The output amplifier power supply provides regulated DC voltages of plus and minus 20 volts. The regulators operate as operational amplifiers with a zener diode providing a reference for the negative supply which, in turn, provides a reference for the positive supply. The power supply block diagram is shown in Figure 4-3.



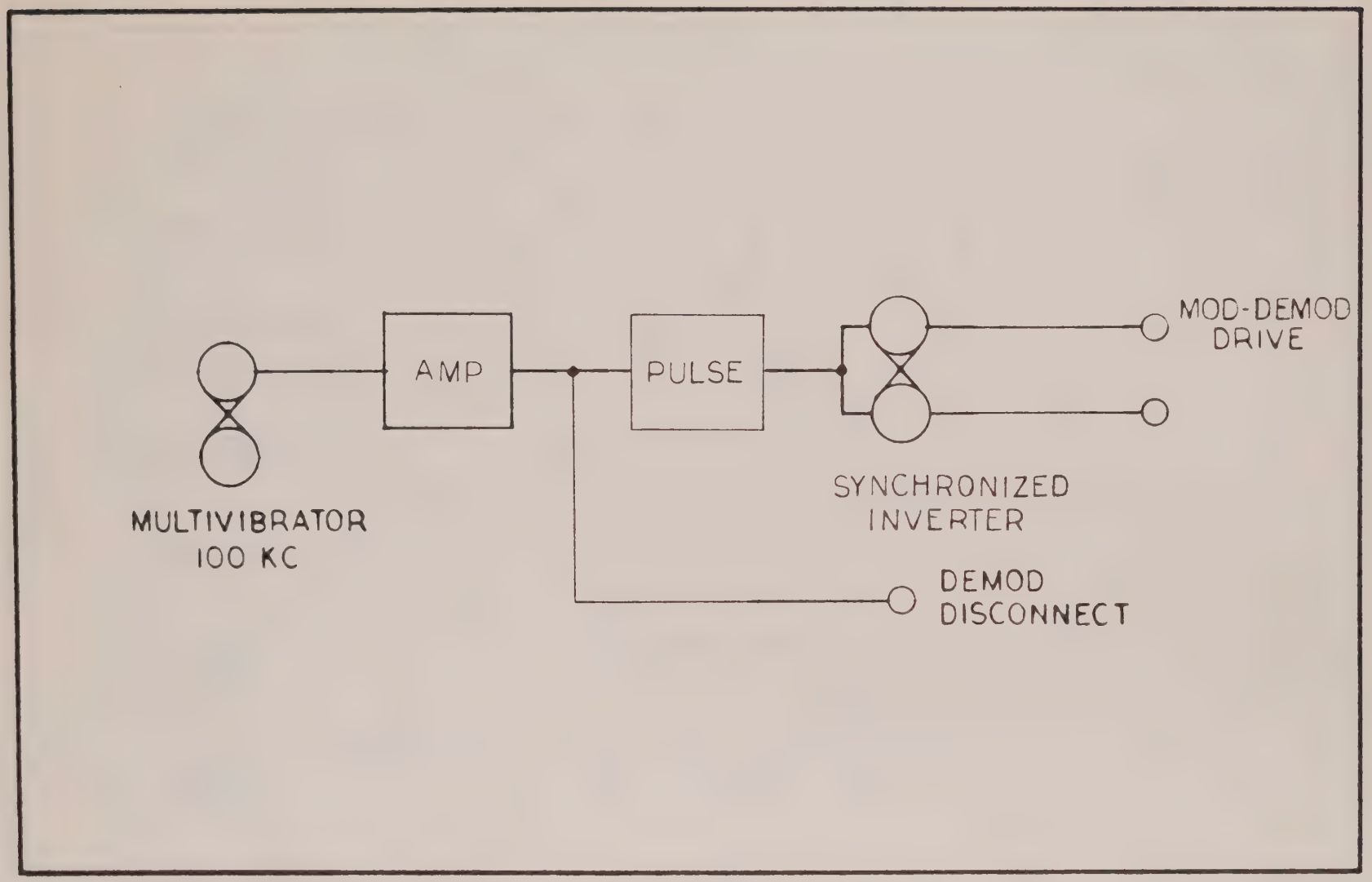
POWER SUPPLY BLOCK DIAGRAM

FIGURE 4-3



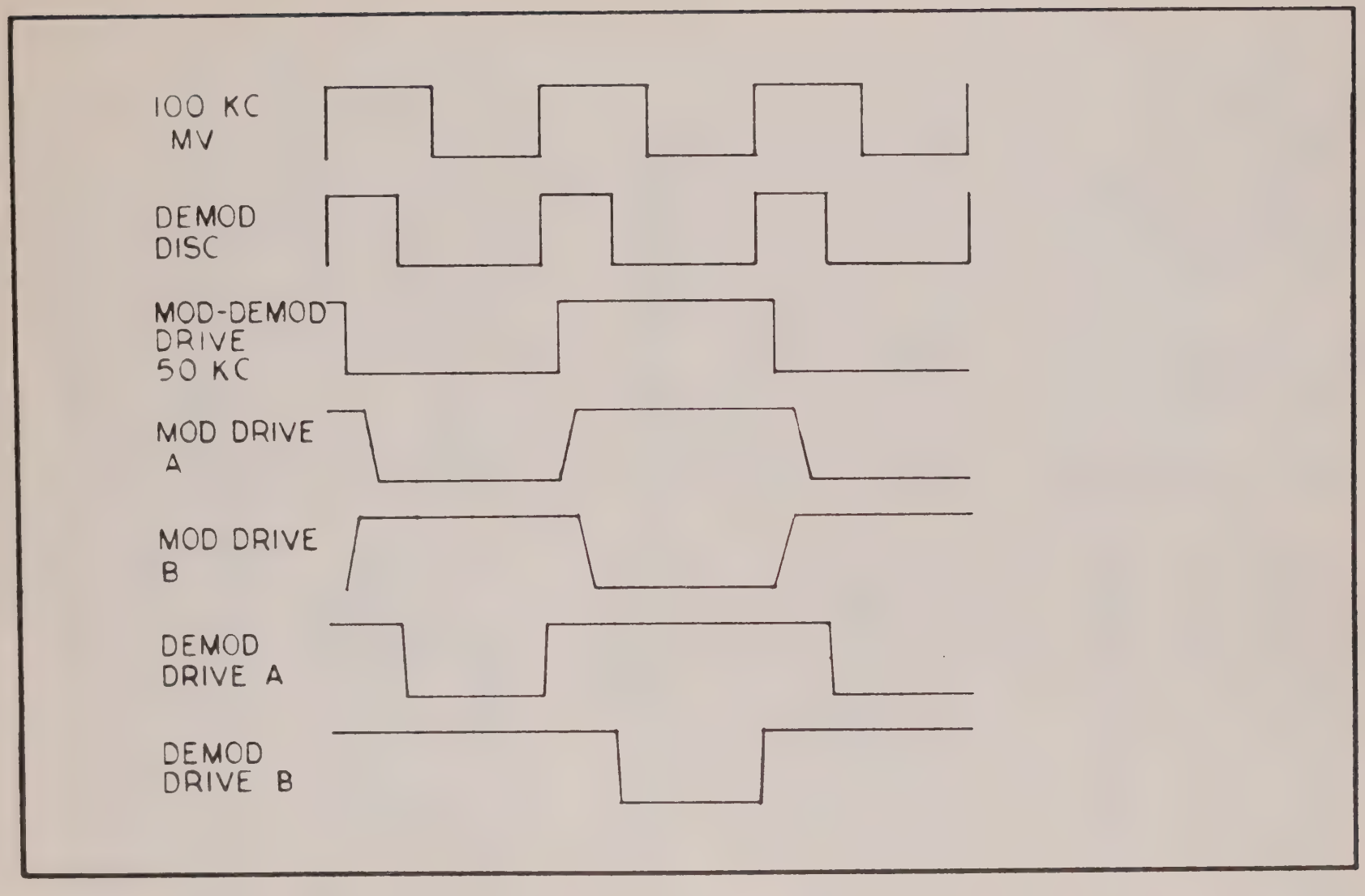
ISOLATOR BLOCK DIAGRAM

FIGURE 4-4



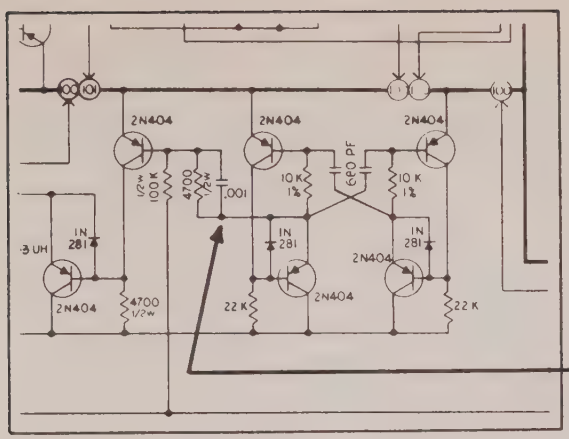
ISOLATOR TIMING LOGIC

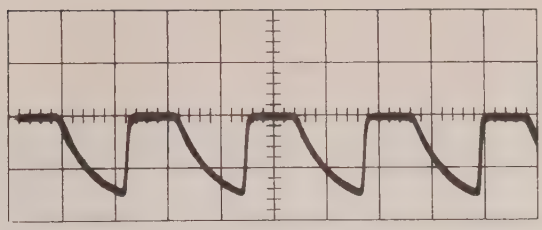
FIGURE 4-5



ISOLATOR TIMING

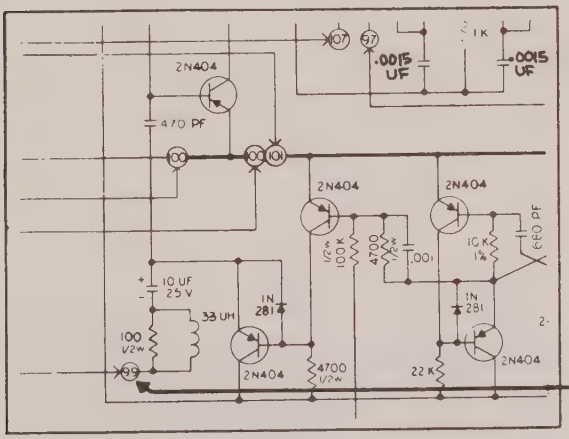
FIGURE 4-6

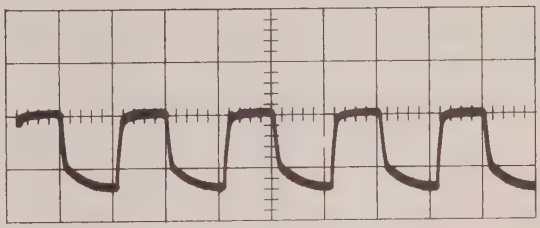




100 KC MULTIVIBRATOR

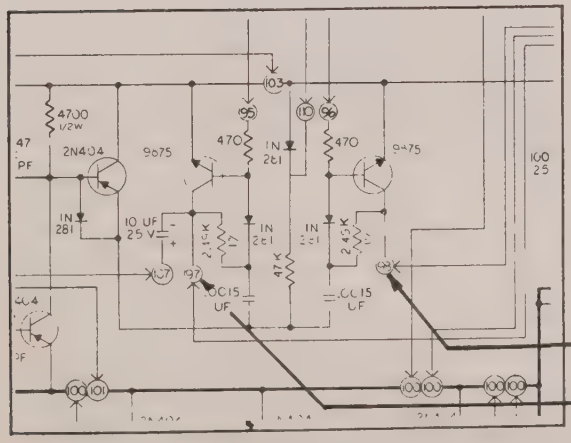
Connect high side of scope to this point and low side to Terminal 100.

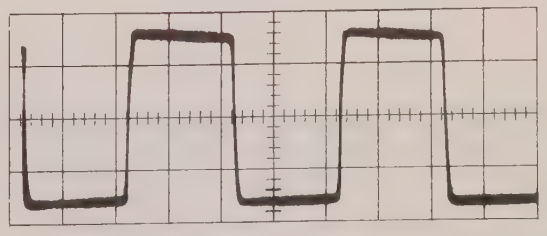




DEMOD DISCONNECT

Connect high side of scope to Terminal 99, and low side to Terminal 100. Connect external sync to Terminal 98.





50 KC DRIVE FOR MOD-DEMOD

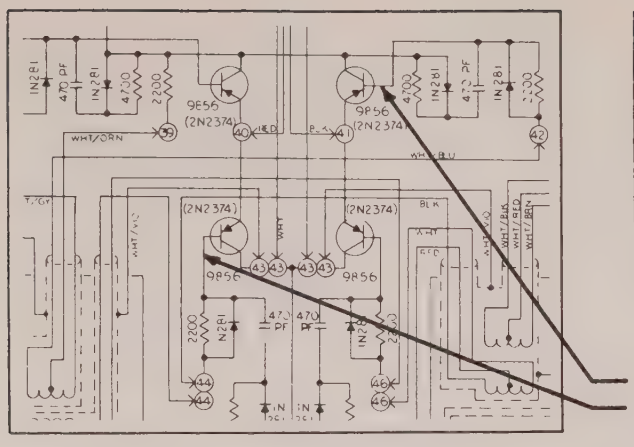
Connect scope external sync to Terminal 98.

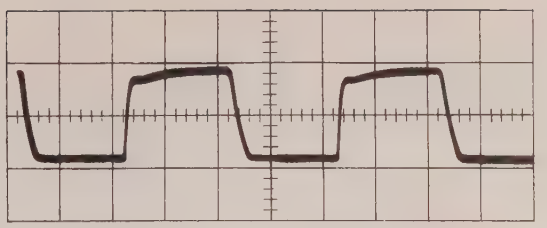
Connect high side of scope to Terminal 97 and low side to Terminal 100.

NOTE: Set amplifier OFF-FIXED switch to OFF position. Set scope vertical sensitivity to 10 volts per centimeter and horizontal sensitivity to 5 microseconds per centimeter.

ISOLATOR TIMING

FIGURE 4-7



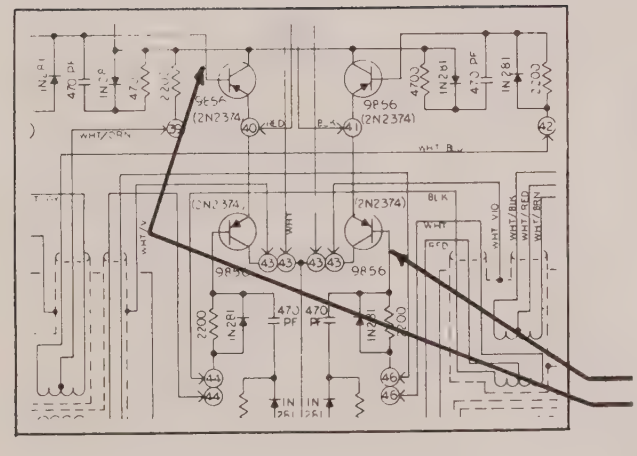


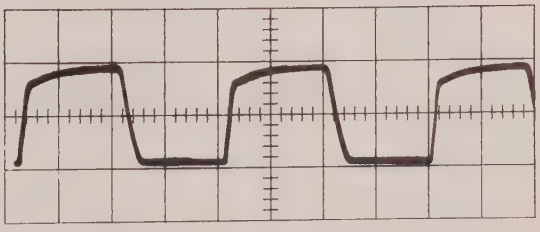
MOD DRIVE A

Connect high side of scope to the base of either of these two transistors, and low side of scope to Terminal 43.

Connect scope external sync to Terminal 98.

In checking the other transistor, the waveform at both bases should be alike.





MOD DRIVE B

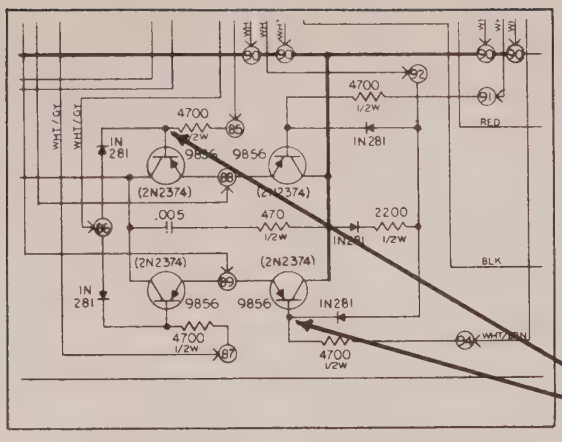
Connect high side of scope to the base of either of these two transistors, and low side of scope to Terminal 43.

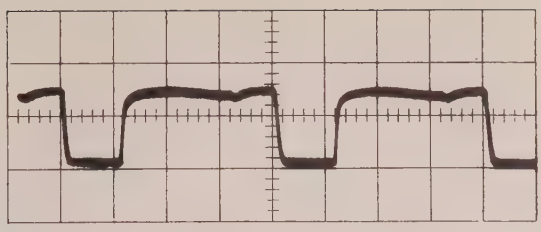
Connect scope external sync to Terminal 98.

In checking the other transistor, the waveform at both bases should be alike.

NOTE: Set amplifier OFF-FIXED switch to OFF position. Set scope vertical sensitivity to 10 volts per centimeter and horizontal sensitivity to 5 microseconds per centimeter.

ISOLATOR TIMING
FIGURE 4-8



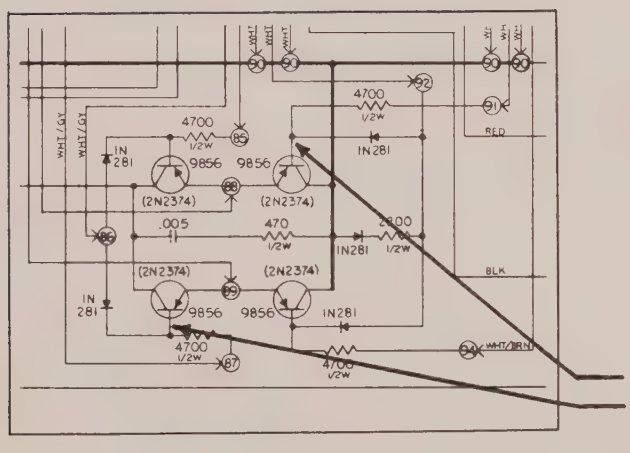


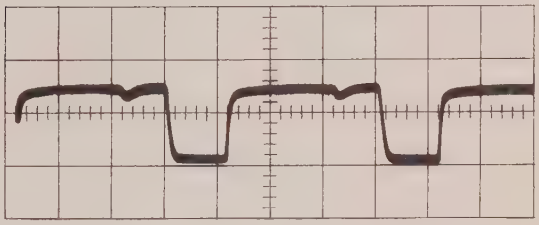
DE-MOD DRIVE A

Connect high side of scope to the base of either of these two transistors, and low side of scope to Terminal 90.

Connect scope external sync to Terminal 98.

In checking the other transistor, the waveform at both bases should be alike.





DE-MOD DRIVE B

Connect high side of scope to the base of either of these two transistors, and low side of scope to Terminal 90.

Connect scope external sync to Terminal 98.

In checking the other transistor, the waveform at both bases should be alike.

NOTE: Set amplifier OFF-FIXED switch to OFF position. Set scope vertical sensitivity to 10 volts per centimeter and horizontal sensitivity to 5 microseconds per centimeter.

ISOLATOR TIMING
FIGURE 4-9

SECTION 5

MAINTENANCE

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5.4	LINEARITY AND GAIN	5-2
5.5	COMMON MODE REJECTION	5-2
5.6	TROUBLE SHOOTING	5-3

SECTION 5

MAINTENANCE

5.1 GENERAL

The Model 8300-RC Amplifier is designed for long maintenance-free operation. This section describes procedures to be used in bench-testing for purposes of calibration, and for trouble-shooting in the event of component failure.

5.2 POWER SUPPLIES

Lower Amplifier:

a) Connect the meter between Terminal 100 (+) and Terminal 103 (-).

b) Using potentiometer near Terminal 103, set the minus supply to a voltage between 20 volts and 21 volts.

c) Connect the meter between Terminal 100 (-) and Terminal 77 (+).

d) Measure the plus supply voltage; it should be between 20 volts and 22 volts.

Upper Amplifier:

a) Connect the meter between Terminal 54 (+) and Terminal TP-(-) (near Terminal 49); it should be 20 to 22 volts.

b) Connect the meter between Terminal 54 (-) and Terminal TP+(+) (near Terminal 50); it should be between 20 and 22 volts.

5.3 AMPLIFIER ZERO

a) Apply a short to the input of the amplifier with the amplifier set to its lowest gain.

b) Adjust the front panel zero set for zero output.

c) Switch to the highest gain and adjust the upper amplifier chopper amplifier control for zero output. This control is located on the upper amplifier next to Terminal 34 and may be reached through the hole in the inner cover.

5.4 LINEARITY AND GAIN

a) Using the circuit of Figure 5-1, the gain and linearity of the amplifier may be tested. The CAL ADJUST on front panel should always be set at the lowest gain.

b) After adjusting the CAL ADJUST on the front panel, you will select the next gain step by energizing the proper relays. The gain adjustments should be adjusted in sequence of lowest to highest. After completing the sequence, it is advisable to complete the above procedure a second time.

c) Figure 5-2 shows a typical plot derived during gain and linearity testing.

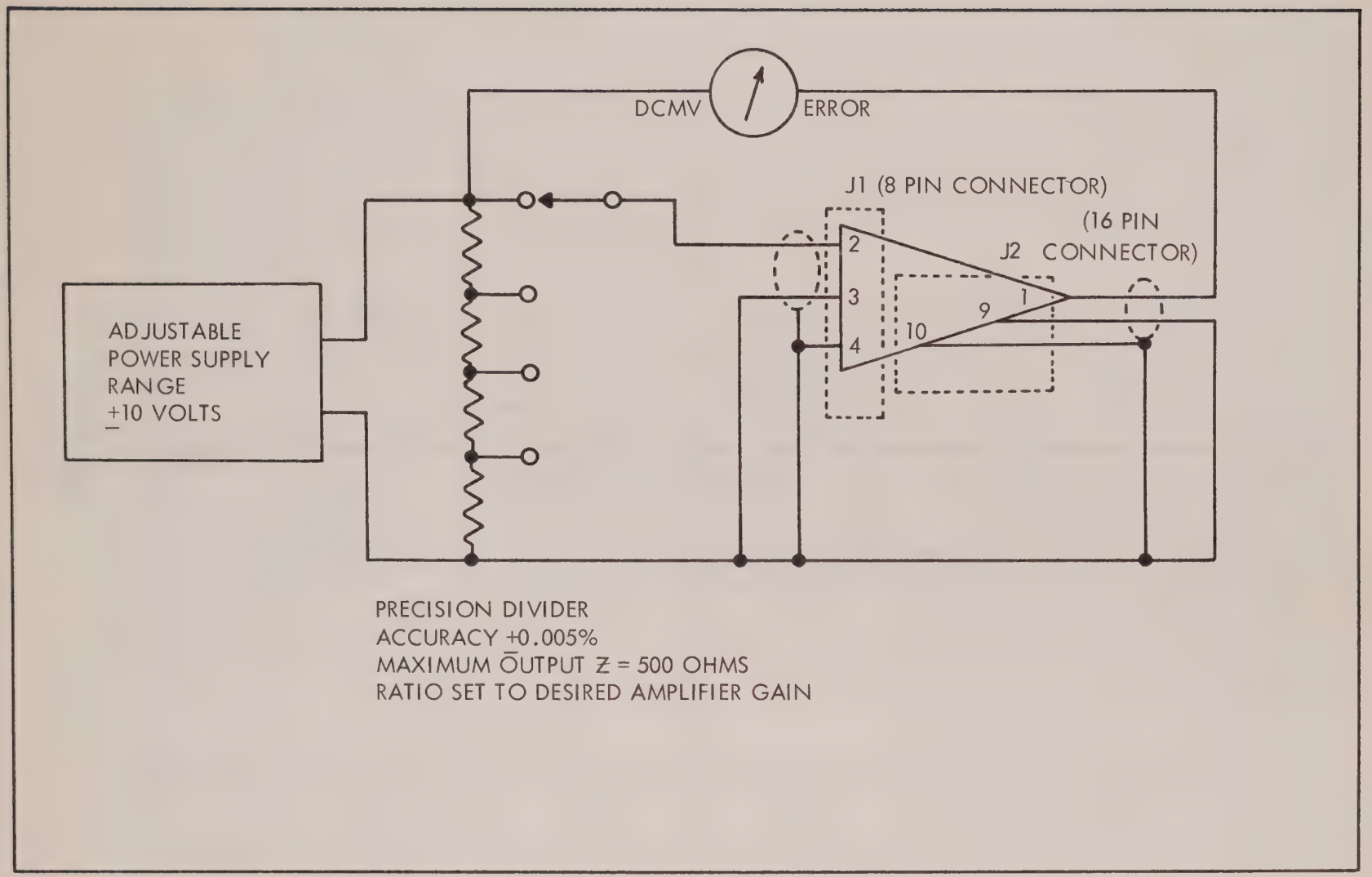
5.5 COMMON MODE REJECTION

a) Using the circuit of Figure 5-3, apply 120 volts rms, 60 cps (330 volts peak-to-peak).

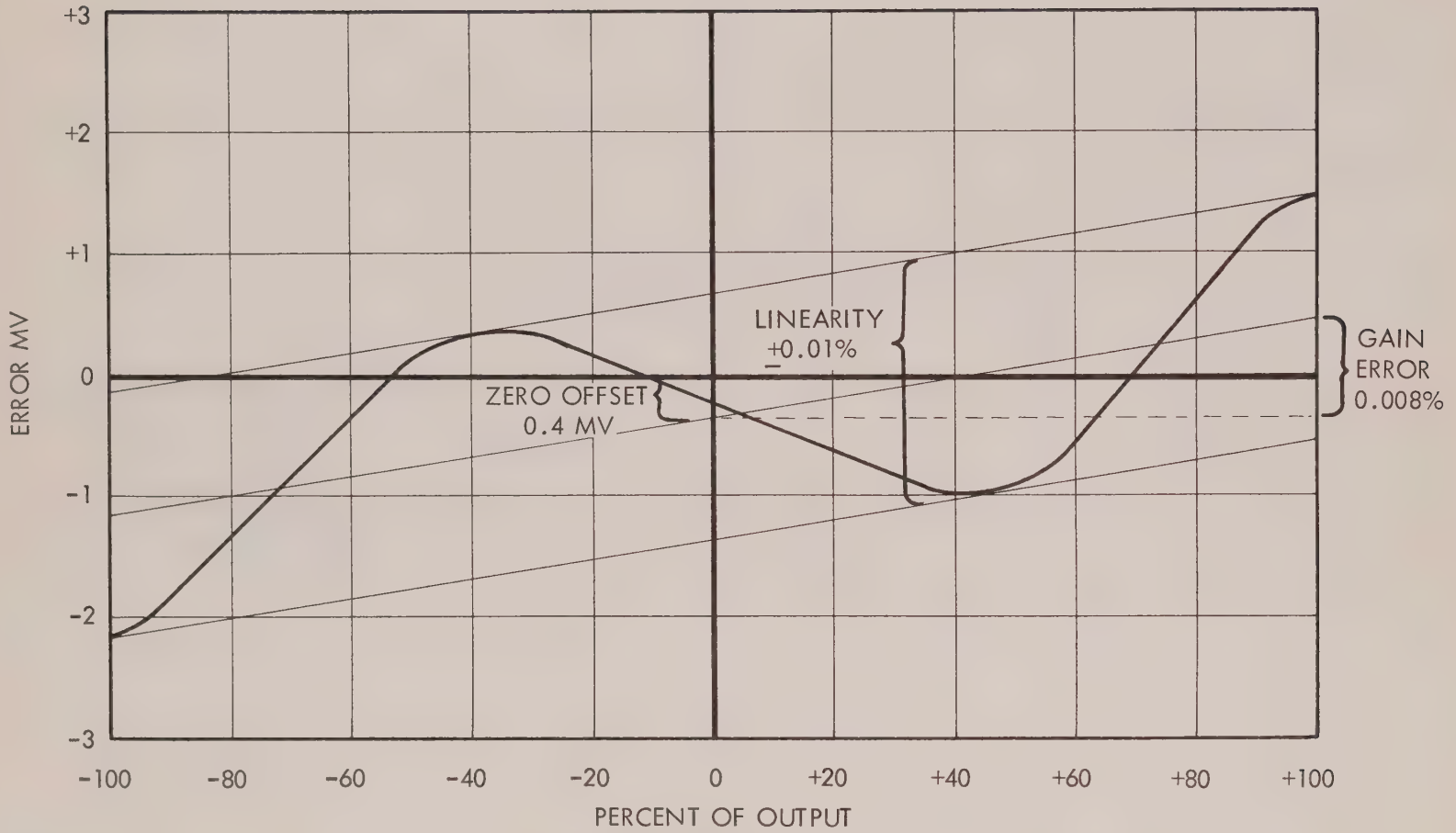
b) Measure the resulting output on an oscilloscope. The peak-to-peak output should be less than 338 microvolts times the gain.

c) Common mode rejection tests should be made with all other external circuits disconnected.

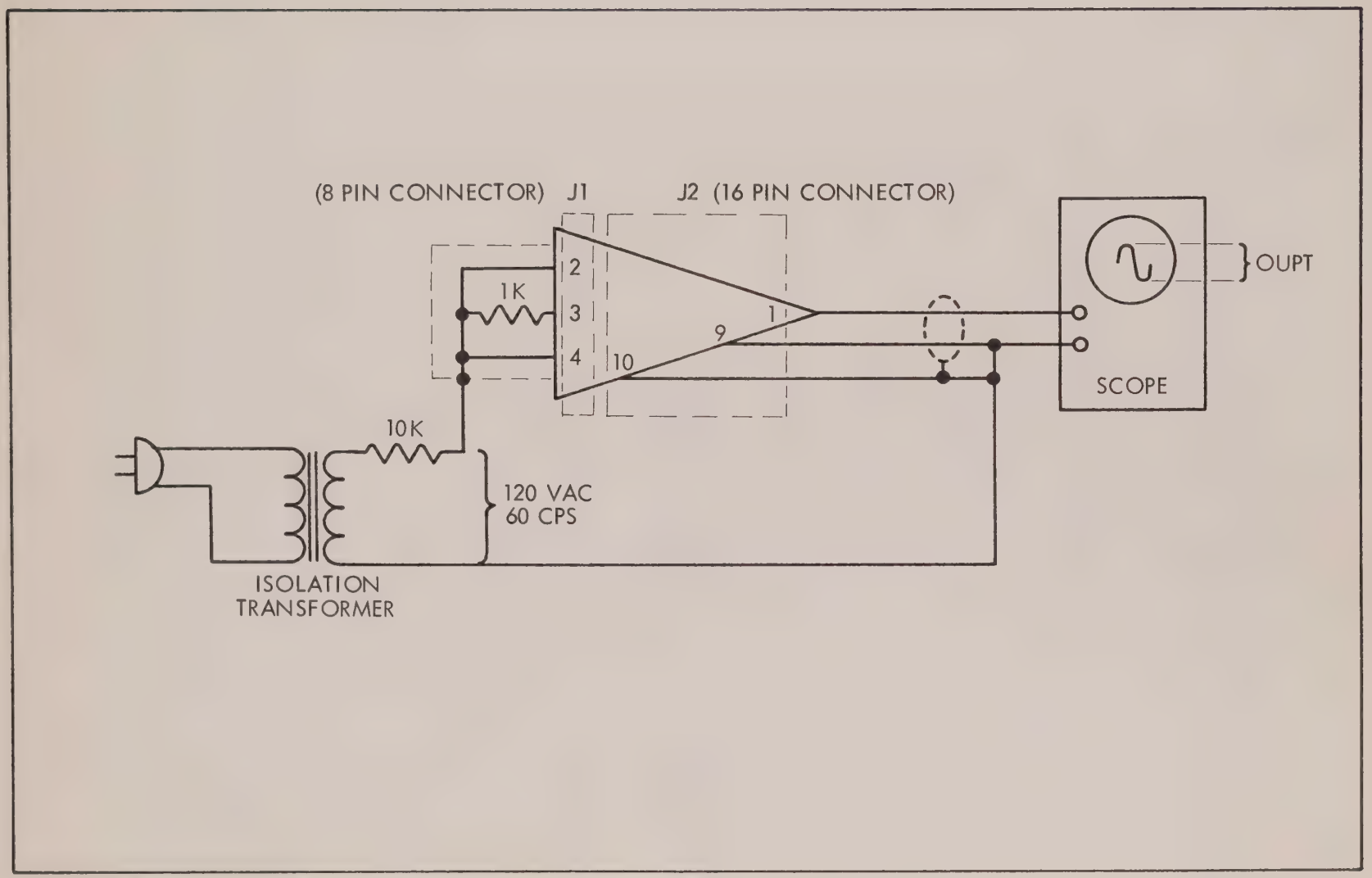
d) In case the peak-to-peak output exceeds 338 microvolts, factory service will be required.



GAIN AND LINEARITY TEST CIRCUIT
FIGURE 5-1



TYPICAL GAIN AND LINEARITY PLOT
FIGURE 5-2



COMMON MODE TEST CIRCUIT
FIGURE 5-3

5.6 TROUBLESHOOTING

The MODEL 8300 RC AMPLIFIERS have been designed for long, maintenance-free operation. As with most electronic equipment, after many hours of operation, a component may become erratic or fail. This section covers the troubleshooting and repair of the amplifier.

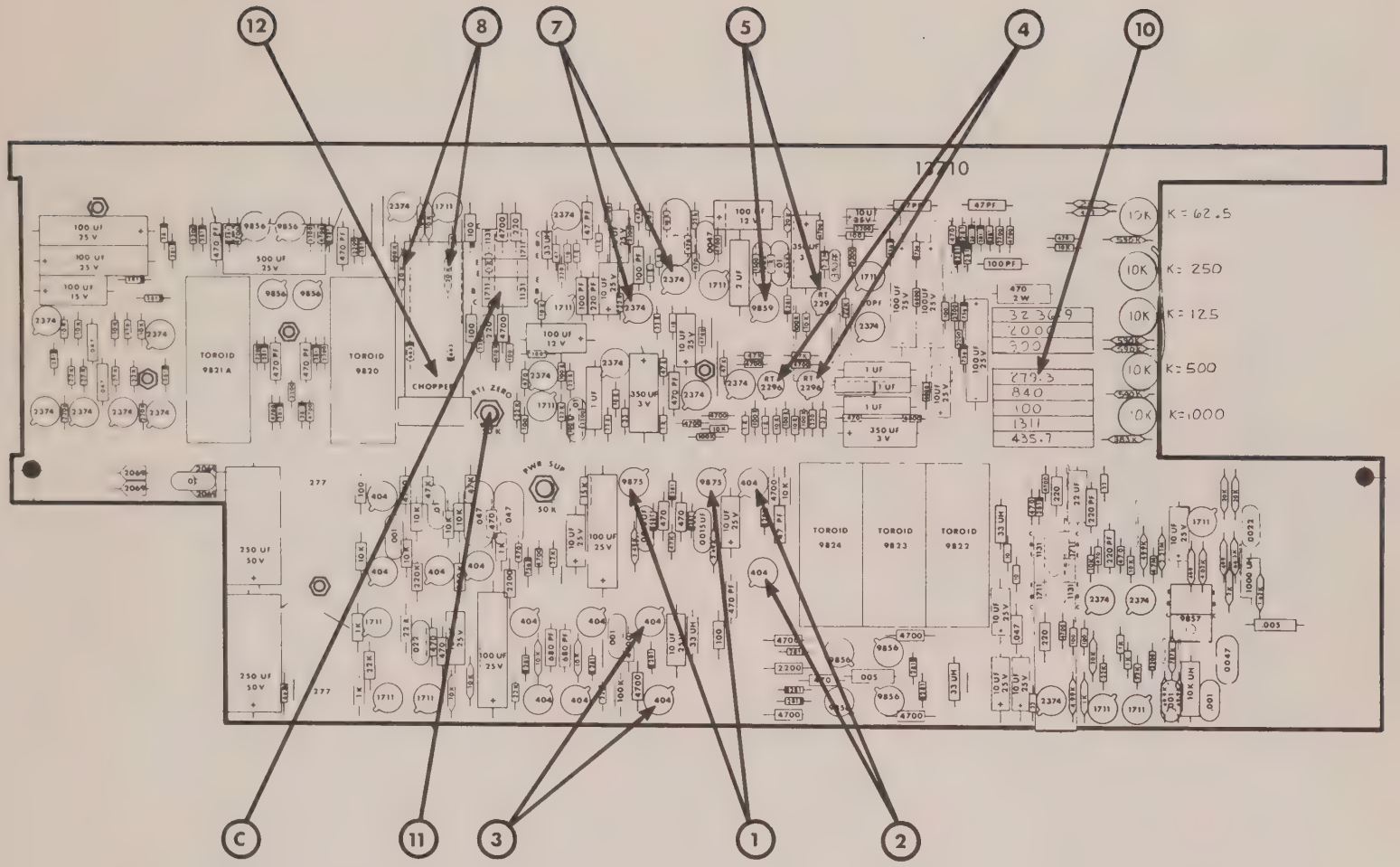
POSSIBLE PROBLEMS AND SOLUTIONS: All areas, i.e., (1), (2), (3), etc., listed below, are clearly shown on Figure 5-4.

Symptom	Probable Cause	Cure
Blows fuses	Two transistors blown in Area (1)	Replace transistors
Blows fuses	Two transistors blown in Area (2)	Replace transistors
Blows fuses	Two transistors blown in Area (3)	Replace Transistors
Blows fuses	Inner shield has pinched wires (only if covers have been removed and replaced)	Make sure wires are clear of shields when replacing
Low frequency noise at gain of 1000	Either one or both transistors may be noisy -- Area (4)	Replace transistors

Symptom	Probable Cause	Cure
Low frequency noise at gain of 1000	Either one or both transistors may be noisy -- Area (5)	Replace transistors
Low frequency noise at gain of 1000	The diodes may be noisy -- Area (6)	Replace diodes
High frequency noise at gain of 1000	The two transistors may be noisy -- Area (7)	Replace transistors
Input signal of either plus (+) or negative (-) or both will not produce output	Check that amplifier is turned ON	Place switch in fixed or variable position
Input signal of either plus (+) or negative (-) or both will not produce output	Either one or both 20k resistors may be broken due to the amplifier being dropped -- Area (8)	Replace resistors
Input signal of either plus (+) or negative (-) or both will not produce output	Check heat sinks for shorts, Areas (A), (B), (C) and (D), on dual amplifiers	Replace heat sinks
Gain setting error of less than 0.1% on 0.01% amplifier	Divider resistor network may have aged or component changed due to overheating -- Area (9)	Adjust trim pots
Gain setting error of less than 0.1% on 0.01% amplifier	Divider resistor has changed or amplifier may be in variable gain position -- Area (10)	Change resistor, or if applicable, switch to fixed gain position
Amplifier will not zero at high gain	RTI adjustment has changed due to component aging -- Area (11)	Adjust RTI pot for zero output per "Upper Amplifier Zero" section
Amplifier output goes to full scale after unit is turned ON	Chopper may be bad -- Area (12)	Replace chopper

Symptom	Probable Cause	Cure
Amplifier output swings from full scale plus (+) to full scale minus (-) after warmup at a slow rate	Chopper may be bad -- Area (12)	Replace Chopper
Amplifier output locks up at full scale	Check for loose leads or broken wires and heat sink shorts	Repair as necessary

IT IS RECOMMENDED that if any major component has failed, or, if under normal troubleshooting techniques you are unable to locate the problem, you should call the manufacturer for technical assistance or return the amplifier to the manufacturer for repair.



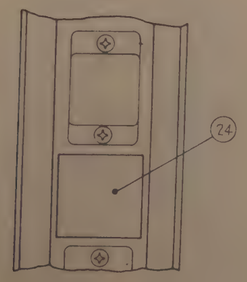
TROUBLESHOOTING COMPONENT LOCATION
FIGURE 5-4

SECTION 6

STANDARD DRAWING LIST

The drawings noted on the following pages define a specific type of amplifier. The dash numbers following the 13700 indicate a customer requirement and define special attenuator circuits that provide required gains.

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED



VIEW A-A

3. APPLY SEALANT (ITEM 50) TO THREADS OF MOUNTING SCREW.
2. SEE DWG 13700-[illegible] SH [illegible] OF [illegible] FOR SCHEMATIC DIAGRAM.
1. ITEMS 27 & 28 ARE THE MATING CONNECTORS.

ITEM	REQD	PART NO.	DESCRIPTION	VALUE	REFERENCE DESIGNATION
			NUT, 1/4-32		
877A	52	2	WASHER, LOCK 1/4		
870	51	2	WASHER, FLAT 1/4		
895	50	AR	SEALANT, LOCKTITE		
676	49	2	HA1-6B-7	PAN HD. M.S., 6-32 X 7/16	
863	48	2		WASHER, ET # 6	
641	47	23	HA1-6D-6	FLAT HD. M.S., 6-32 X 3/8	
674	46	1	HA1-6B-5	PAN HD. M.S., 6-32 X 5/16	
636	45	2		FLAT HD. M.S., 4-40 X 13/16	
624	44	10		FIL. HD. M.S., 4-40 X 3/8	
630	43	2	HA1-4D-5	FLAT HD. M.S., 4-40 X 5/16	
665	42	2	HA1-4B-5	PAN HD. M.S., 4-40 X 5/16	
302	41	1	HD3-1	NUT, TINNERMAN # 6	
297	40	6	HC2-2	NUT, LOCK 6-32	
296	39	5	HC2-1	NUT, LOCK 4-40	
855	38	16		WASHER, FLAT # 4	
875	37	11	GD6-1	WASHER, LOCK # 6	
854	36	13	GA6-2	WASHER, FLAT # 6	
851	35	5	GB14-1	WASHER, [illegible] 1/8	
874	34	5	GD4-1	WASHER, LOCK # 4	
380	33	1		RELAY	24V
616	32	2	RF2-1750-1	RESISTOR, 1 AW 5%	75Ω
328	31	AR	EC1-1	PIN, TAPER	
23	30	3	DB1-1	CLAMP, CABLE	
	29				
201	28	1	JB2-8	CONNECTOR, 16S	P2 AMP 26-4301-16S
200	27	1	JB2-7	CONNECTOR, 8S	P1 AMP 26-4301-8S
	26	1	13718	SUPPORT, RELAY	
	25	2	13717	STANDOFF	
	24	1	8353	NAME TAG	
	23	2	9806	COVER, OUTER	
	22	1	13746	COVER, INNER "W" SIDE	
	21	1	13745	COVER, INNER "C" SIDE	
	20	1	12053	SHIELD, "C" SIDE	
	19	1	12052	SHIELD, "W" SIDE	
	18	2	12005-2	SHAFT GUIDE	
	17	2	12027	BRACE, SINGLE POT	
	16	1	9848-1	HANDLE	
	15	1	8373	KNOB	
	14	1	13709-31	SWITCH	
	13	1	13701-[illegible]	PANEL, FRONT	
	12	2	12018	EXTENDER ASSY, SHAFT	
	11	1	13705	BRACKET ASSY, RELAY	
	10	1	12083	POTENTIOMETER, ASSY	
	9	1	12081	POTENTIOMETER, ASSY	
	8	1	12050	POWER TRANSISTOR, ASSY	
	7	1	13720-1	FRAME, ASSY	
	6	1	9824	TRANSFORMER, ASSY	
	5	1	9823	TRANSFORMER, ASSY	
	4	1	9822	TRANSFORMER, ASSY	
	3	1	9821A	TRANSFORMER, ASSY	
	2	1	9820	TRANSFORMER, ASSY	
	1	1	13710-3[illegible]	P.C. ASSY, AMPLIFIER	

BOX NO.

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED
MECHANICAL DWG TOLERANCES
X ± .050 ANGULAR ± 0° 30'
XX ± .020
XXX ± .005 MACH. SURF. 63
THREADS: CLASS 2A OR 2B
REMOVE BURRS & SHARP EDGES .020 MAX.
MACH. FILLET RADIUS .500 R MAX.
MACH. SURF. FLAT WITHIN .001 IN/IN
OTHER SURF. FLAT WITHIN .005 IN/IN
ELECTRICAL DWG DESIGNATIONS
REFERENCE DESIGNATIONS ARE ABBREVIATED HEREIN THE DESIGNATION WITH UNIT NUMBER OR ASSEMBLY DESIGNATION OR BOTH.

DRAWN [illegible] DATE [illegible]
CHK [illegible]
ENGR [illegible]
APPD
APPD

ABBREVIATIONS PER MIL-STD-12

TITLE AMPLIFIER ASSY — 8300-HRL

PRESTON SCIENTIFIC INCORPORATED Anaheim, Calif.

MATERIAL

FINISH

SCALE 1/1

SIZE D

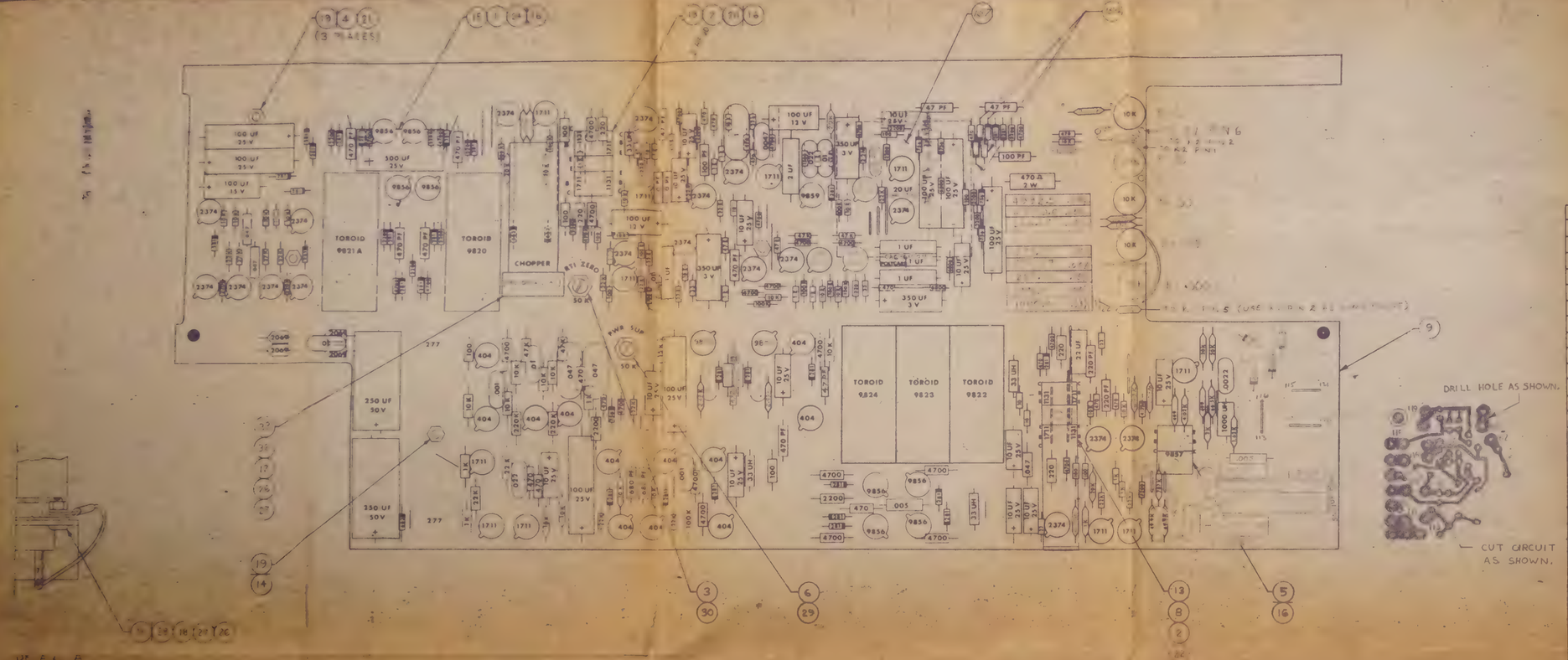
13700-55

CODE

SH 1 OF 1

MASTER 17

SPDER



REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
A	REVISED PER EO 2144	[illegible]	[illegible]
B	REVISED PER EO 2122	[illegible]	[illegible]
C	REVISED PER EO 2268	[illegible]	BA/WA
D	REVISED PER EO 2271	4-4-67	BW/WA
E	REVISED PER EO 2269	4-5-67	BW/WA
F	REVISED PER E.O. 2344	6-12-67	KH/JM
G	SEE NEREM EO 2588	12-26-67	MC/GA
H	18136 P.C. REC. WERE 8700 P.C. REC. SEE E.O. 2597	1-26-68	SF/WAL
J	SEE E.O. 2669	2-15-68	RR/WJS
K	ED 2854	5-22-68	RR

ITEM	REQD	PART NO.	DESCRIPTION	VALUE	REFERENCE DESIGNATION
60	1	25049	CAPACITOR	2UF,100V	
59	3	25046		1UF,100V	
58	1	25042		.47UF 52	
57	1	25033		.22 UF	
56	2	25026		.047 UF	
55	2	25017		[illegible]	
54			CAPACITOR	5UF	
53	4	2N1131	TRANSISTOR	2N1131	824
52	1	2N1711		2N1711	829
51	1	2N2374	TRANSISTOR	2N2374	834
50	2		TRANSISTOR SELECTION		
49	3			RT2296	833
48	1	9859			
47	2	9856	TRANSISTOR SELECTION		
46	12	TAI-0404	TRANSISTOR	2N404	817
45	35	QB1-0281	DIODE	1N281	231
44	3	QB2-0648	DIODE	1N648	239
43	5	QB2-0754	DIODE	1N754	235
42	4	QB2-2023	DIODE	1N2023	24
41					
40	4	TAI-1330-1	CHOKE	33UH	
39	1	TAI-3100-1	CHOKE	1000 UH	1
38	1	TAI-4100-1	CHOKE	10K UH	13
37					
36	1	TAI-4500-2	POT, CTS	50K	365
35	1		POT, CTS	10K	357
34					
33	1	KAI-	CHOPPER		
32					
31					
30	1	DFI-2	COMPRESSION RING		43
29	1	DFI-1	COMPRESSION RING		42
28			WASHER, LOCK		8[illegible]
27	8	GD2-1	WASHER, LOCK		378
26	2	HCI-1	NUT HEX.		315
25					
24		DQI-7	POST		745
23					
22	1	DQI-5	POST		740
21	4	DQI-4	POST		739
20	1	DQI-3	POST		7[illegible]
19	5	DQI-2	POST		737
18		[illegible]-1	LUG [illegible]		735
17					
16	16	HAI-4F-5	SCREW		[illegible]
15	1	HAI-4D-3	SCREW, FLAT HD.		63
14	1	HAI-6G-5	SCREW, FIL. HD.		682
13	2	HAI-4B-3	SCREW, PAN HD.		6[illegible]3
12	1	HAI-2J-3	SCREW, BINDER HD.		702
11	1	HAI- -3	SCREW, BINDER HD.		703
10					
9	1	13711	CIRCUIT BOARD RIVET ASSY.		
8	1	[illegible]	HEAT SINK		
7					
6	1	12003	SHAFT EXTENDER		
5	1	9857-1	TRANSISTOR ASSY.		
4	3	9854	ROD THREADED		
3	1	9847	SHAFT EXTENDER		
2	3	9817	HEAT SINK		
1	1	8369	CLIP, CAPACITOR		

LIST OF MATERIALS

BY	DATE
BRAWN	
CHK	
ENGR/	
APPD	
APPD	

TITLE: CIRCUIT BOARD ASSEMBLY

PRESTON SCIENTIFIC INCORPORATED Fullerton, California

MATERIAL

FINISH

SIZE D | CODE | SH 1 OF 1

13710-30

ITEM	REQD	PART NO	DESCRIPTION	VALUE	REF. DESIGNATION
168					
167					
166					
165					
164					
163					
162					
161					
160					
159					
158					
157	1	13715	[illegible] ASSY		
156		CM-220-1	CAPACITOR	22 PF	
155			RESISTOR 1% 1/4W	2.21M	488
154	4	2375	DIODE		
153					
152		EB-3470-1	RESISTOR ±10% 2W	470Ω	607
151					
150	A/R	PBI-1	SLEEVING .23 AWG		
149	A/R	WAI-1	WIRE .22 AWG		
148		18136-	RESISTOR PRESTON [illegible]	100Ω	
147					
146	1	CAB-8500-1	CAPACITOR	500 UF, 25V	153
145	2	CAB-8250-1		250 UF, 50V	150
144	3	CAB-8350-1		350UF, 3V	151
143	7	CAB-8100-3		100 UF, 25V	14[illegible]
142	1	CAB-8100-2		100 UF, 15V	147
141	2	CAB-8100-1		100 UF, 12V	146
140	3	CAB-7100-1	CAPACITOR	10 UF, 25V	142
139		RE 30-1774-2	RESISTOR PRESTON [illegible]	1774 Ω	
138	1	[illegible]	[illegible]	[illegible] Ω	
137	1	[illegible]	RESISTOR PRESTON .05%	4332.5 Ω	
136	1	[illegible]	[illegible]	[illegible] Ω	
135	1	[illegible]	[illegible]	266.77 Ω	
134	1	[illegible]	[illegible]	[illegible] Ω	
133	1	[illegible]	RESISTOR ASSY.		

ITEM	REQD	PART NO	DESCRIPTION	VALUE	REF. DESIGNATION
152					
131	2	RC3-5220-1	RESISTOR ±10% 1/2W	220K	7[illegible]
130	1	RC3-5100-1		100K	8[illegible]
129	2	RC3-4470-1		47K	5[illegible]
128	2	RC3-4220-1		22K	5[illegible]
127	1	RC3-4150-1		15K	5[illegible]
126	6	RC3-4100-1		10K	5[illegible]
125	10	RC3-3470-1		4700Ω	5[illegible]
124	2	RC3-3220-1		2200Ω	570
123	5	RC3-3100-1		1K	574
122	6	RC3-2470-1		470Ω	571
121	4	RC3-2220-1		220Ω	5[illegible]
120	4	RC3-2100-1	RESISTOR ±10% 1/2 W	100Ω	566
119					
118	1				
117	1	RB3-6470-1	RESISTOR ±1% 1/4W	4.7M	555
116	1	RB3-6220-1		2.2 M	553
115	1	RB3-5470-1		470K	550
114	2	RB3-5220-1		220K	548
113	9	RB3-5100-1		100K	547
112		RB3-4470-1		47K	544
111	2	RB3-4270-1		27K	542
110	10	RB3-4220-1		22K	541
109	14	RB3-4100-1		10K	538
108	3	RB3-3680-1		6800Ω	537
107	16	RB3-3470-1		4700Ω	536
106	1	RB3-3220-1		2200Ω	533
105	1	RB3-3150-1		1500Ω	532
104	1	RB3-3100-1		1K	531
103	13	RB3-2470-1		470Ω	529
102	2	RB3-2220-1		220Ω	527
101		RB3-2100-1		100Ω	525
100	1	RB3-1470-1		47Ω	523
99	2	RB3-1330-1		33Ω	522
98	2	RB3-1220-1		22Ω	521
97	4	RB3-1100-1	RESISTOR	10Ω	520

ITEM	REQD	PART NO	DESCRIPTION	VALUE	REF. DESIGNATION
96	1	[illegible]	RESISTOR 1/4W 1%	[illegible]	4[illegible]
95	1	[illegible]	RESIST [illegible]	1.87M	504
94					
93					
92	1	RB-5787-	[illegible] 1/4 W	787 K	491
91	1	RB-6100-1		1 MEG	4[illegible]
90	1	RB1-4665-		66.5 K	47[illegible]
89	2	RB1-4493-1		49.9K	477
88	6	RB1-4203-1		20K	46[illegible]
87	6	RB1-4103-		10K	45[illegible]
86	2	RB1-3493-1		4.99 K	481
85	1	RB1-3499-		4.99K	446
84	1	RB1-3402-1		4.02K	440
83	1	RB1-3200-1		2K	422
82	1	RB1-3162-1		1.62K	418
81	1	RB1-3301-1		3.01K	434
80	1	RB1-3100-1		1K	409
79	2	RB1-2499-1	RESISTOR	499 Ω	400
78	1		RESISTOR ±1% 1/4W	1.21M	488
77	2	CA4-3150-1	CAPACITOR	.0015 UF	80
76	1	CA4-5100-	CAPACITOR	.1 UF	110
75	3	CA4-4470-1		.047UF	105
74	2	CA4-4220-		.022 UF	98
73	4	CA4-4100-1		.01 UF	93
72	2	CA4-3470-1		.0047 UF	87
71	1	CA4-3220-1		.0022UF	83
70	4	CA4-3100-1		.001 UF	81
69	2	CA1-2680-1		680 PF	73
68	6	CA1-2470-1		470PF	77
67	3	CA1-2220-1		220 PF	65
66	3	CA1-2100-1		100 PF	61
65	4	CA1-1470-1	CAPACITOR	47 PF	58
64	1	[illegible]	CAPACITOR PRESTON	5.0E ±5%	
63	1	25048	CAPACITOR, PRESTON	1UF, 50V, 20%	
62	1	25039	CAPACITOR, PRESTON	2.0UF, 50V.	
61	1	[illegible]	CAPACITOR	.047 UF	

ITEM	REQD	PART NO	DESCRIPTION	VALUE	REF. DESIGNATION

SECTION 7

SPARE PARTS

The component parts listed on the following page (s) are considered to be off-the-shelf items and the prices are subject to change without notice.

RECOMMENDED SPARE PARTS LIST
PRESTON MODEL 8300-RC AMPLIFIER

Box No.	Part No.	Description	Value	Qty	Price Each
	12058	Capacitor Assembly, Preston	20 ufd	1	$10.00
	25051	Capacitor	5 ufd	1	5.25
16	KA1-2	Chopper, Bristol (C-1417-45)		1	75.00
817	QA1-0404	Transistor, RCA	2N404	2	.75
834	QA1-2374	Transistor, Lansdale	2N2374	4	1.80
824	QA2-1132	Transistor, TI	2N1132	2	1.38
828	QA2-1711	Transistor, Raytheon	2N1711	4	1.05
833	QA2-2296	Transistor, Raytheon	RT2296	2	4.20
231	QB1-0281	Diode, Sylvania	1N281	10	.50
232	QB2-0663	Diode, Raytheon	1N663	2	.58
243	QB2-2069	Diode, TI	1N2069	2	.87
235	QC2-0756	Diode, TI	1N756	2	1.05
	9856	Selected Transistor (red dot on top)	2N2374	2	2.25
	9859	Selected Transistor (yellow dot on top)	2N2374	2	3.00
	9875 (matched pair)	Selected Transistor (green dot on top)	2N1711	1	7.68
	8700	Resistor, Preston (The resistor values vary with the type of amplifier. For quantity and value, refer to the 13710 assembly drawing.) (over 10k 4.00)		1	3.00
16	KA1-2	Range-change Relay - Bristol			75.00
381	KD1-2	Range-change Relay - James (The range-change relay configuration varies with the type of amplifier. For type of relay used, refer to 13700 assembly drawing. One of the type used should be included as a part of this list.)			93.50
	9820	Transformer, Preston		1	25.00
	9821A	Transformer, Preston		1	25.00
	9822	Transformer, Preston		1	25.00
	9823	Transformer, Preston		1	25.00
	9824	Transformer, Preston		1	25.00
	12050	Transistor Assembly		1	15.00

*These prices are subject to change without notice.

The products of Preston Scientific Incorporated are marketed throughout the world by a series of authorized representatives. For further information or assistance, contact the local sales representative or the Marketing Department of Preston Scientific. (714) 776-6400